Flat Panel Displays

New coating and cleaning processes developed for flat panel lithography

Precise, multilayer coating process with no waste

LLNL has developed a process to coat large square or rectangular glass substrates up to 400 x 600 mm with liquid suspensions or solutions. Called meniscus coating, it provides precise, uniform layers with no coating fluid waste. The process has been likened to horizontal dip coating and is capable of depositing precise and uniform layers on large substrates, since there are no intrinsically limiting scale up issues as in spin-coating. The only coating fluid used is what is deposited on the substrate, so there is no waste of expensive coating materials or disposal issues. LLNL has routinely coated up to 40 layers in a multilayer application, each approximately 200 nm thick. We have also coated photoresist onto 300-mm-square substrates to within 0.1 µm with nominal thicknesses of 0.2 to 3.2 µm, and have applied Teflon coatings from flouropolymer solutions of up to 17 µm. Also, we have successfully eliminated edge effects and demonstrated that coatings can be applied uniformly during production.

APPLICATIONS

- *Flat panel display processing*
- *Large optic photolithographic processing*
- *Multilayer sol-gel (liquid colloidal suspension) laser reflectors*
- *Integrated circuit processing*

One-step cleaning, developing, or etching

Our ultra-clean drying process provides one-step cleaning, developing, or etching. This non-contact drying process, which uses precisely metered organic solvent vapors and not heat or forced air, can be combined with megasonic cleaning, resist-developing, or wet-etching steps to create modules for flat panel display processing tools. These can be easily combined in a cluster machine capable of performing several process steps in one step.

Our unique, three-dispenser meniscus coating system can produce multilayer coatings on flat substrates up to 400 x 600 mm.

Immediate applications

The unique coating and cleaning technologies we have developed have immediate application in the rapidly growing flat panel display processing industry. We have utilized the multilayer coating capability to make laser damage-resistant mirrors for use in high-power pulsed lasers. We have also developed photolithographic processes for making surface relief patterns on large optics up to 650 mm in diameter. These processing techniques are amenable to large wafer integrated circuit manufacturing as well.

Availability: The technology is available now. LLNL is seeking licensees and/or industrial partners to further develop these technologies through cooperative research and development.

Contact

Jerry Britten
Phone: (510) 423-7653
Fax: (510) 423-4289
E-mail: britten1@llnl.gov
Mail code: L-365

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